

WHAT IS CLAIMED IS:

1. A segmented RF powered electrode apparatus for use in plasma processing, the apparatus comprising:
 - a first electrode;
 - a second electrode surrounding the first electrode;
 - a dielectric material interposed between the first electrode and the second electrode, wherein the dielectric material electrically isolates the first electrode from the second electrode;
 - at least one dual frequency radio frequency (RF) power source adapted to output RF power at a first frequency and a second frequency, wherein the first frequency and the second frequency are different; and
 - at least one radio frequency switch adapted to at least route the first frequency or the second frequency from the at least one dual frequency source to the first electrode, the second electrode, or the first electrode and the second electrode.
2. The apparatus of Claim 1, wherein the first electrode is a circular inner electrode.
3. The apparatus of Claim 1, wherein the second electrode is a ring shaped outer electrode.
4. The apparatus of Claim 1, wherein the dielectric material electrically isolates the first electrode from the second electrode by suppressing radio frequency cross talk between the first electrode and the second electrode.
5. The apparatus of Claim 1, wherein the at least one radio frequency switch includes a first switching array and a second switching array, the first switching array is adapted to supply the dual frequency power source to the first electrode and the second switching array is adapted to supply the dual frequency power to the second electrode.

6. The apparatus of Claim 5, wherein the first switching array and the second switching array has a first switch position, a second switch position and a third switch position, the first switch position routes the first frequency to the electrode, the second switch position routes the second frequency to the electrode, and the third switch position routes neither the first frequency nor the second frequency to the electrode

7. The apparatus of Claim 1, wherein the dual frequency RF power source has a 27 MHz RF generator and a 2 MHz RF generator.

8. The apparatus of Claim 1, further comprising a control unit adapted to control the at least one radio frequency switch.

9. The apparatus of Claim 1, further comprising a plasma etching chamber, wherein the electrode is incorporated in a substrate support, the substrate support supports a single semiconductor wafer, and the substrate support includes an electrostatic chuck which can be used in the plasma etching chamber.

10. The apparatus of Claim 1, wherein the dual frequency power source comprises a single frequency power source, and a coupling switch adapted to couple the first frequency and the second frequency into the single frequency power source.

11. The apparatus of Claim 1, wherein the at least one dual frequency RF power source comprises a first RF power source and a second RF power source, the first RF power source is connected to the first electrode and the second RF power source is connected to the second electrode.

12. The apparatus of Claim 11, wherein the first RF power source has a first switching array adapted to connect the first RF power source to the first

electrode and the second RF power source has a second switching array adapted to connect the second RF power source to the second electrode.

13. The apparatus of Claim 11, wherein the apparatus further includes a coupling switch adapted to couple the first frequency and the second frequency.

14. A plasma processing system comprising:
a substrate support adapted to support a substrate in a plasma reaction chamber of the plasma processing system, the substrate support including a first electrode, a second electrode surrounding the first electrode, and a dielectric material interposed between the first electrode and the second electrode, wherein the dielectric material electrically isolates the first electrode from the second electrode;
at least one dual frequency radio frequency (RF) power source adapted to output RF power at a first frequency and a second frequency, wherein the first frequency and the second frequency are different; and
at least one radio frequency switch adapted to at least route the first frequency or the second frequency from the at least one dual frequency source to the first electrode, the second electrode, or the first electrode and the second electrode.

15. The system of Claim 14, wherein the at least one radio frequency switch includes a plurality of radio frequency switching arrays, the switching arrays are adapted to supply the dual frequency RF power source to the first electrode and the second electrode.

16. The system of Claim 14, wherein the dual frequency RF power source has a 27 MHz RF generator and a 2 MHz RF generator.

17. The system of Claim 14, further comprising a control unit adapted to control the at least one radio frequency switch.

18. A method for processing substrates in a plasma processing system, comprising the steps of:

(a) supporting a substrate on a substrate support in a plasma reaction chamber;

(b) generating plasma in the plasma reaction chamber with a segmented radio frequency (RF) powered electrode having a first electrode, a second electrode surrounding the first electrode, and a dielectric material interposed between the first electrode and the second electrode, wherein the dielectric material electrically isolates the first electrode from the second electrode; and

(c) controlling distribution of power from a dual frequency RF power source supplied to the first electrode and the second electrodes so that uniform processing is applied across a surface of the substrate to be processed, wherein distribution of the power to the first electrode and the second electrode of the substrate is performed by at least one switch adapted to at least route the first frequency or the second frequency from the at least one dual frequency source to the first electrode, the second electrode, or the first electrode and the second electrode.

19. The method of Claim 18, further comprising controlling distribution of RF power to increase the etch rate at the center of the substrate.

20. The method of Claim 18, further comprising controlling distribution of RF power to increase the etch rate at the edge of the substrate.

21. The method of Claim 18, wherein the step of controlling distribution of power from the dual frequency RF power is controlled by a control unit.